COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

September 10, 2015
G0058

Emprise Trust
1925 El Camino De La Luz
Santa Barbara, California 93109

SUBJECT: **Update Report and Response to City Review Team Comments**
RE: 1925 El Camino De La Luz, APN: 045-100-024
Santa Barbara, California

Dear Representative of the Emprise Trust:

At your request, Cotton, Shires and Associates, Inc. (CSA) is providing you with this Update Geologic and Geotechnical Report (letter-report) to summarize the current site surface and subsurface conditions (Section 1). This report is intended to be an addendum to our Geologic and Geotechnical Investigation report, dated October 8, 2012. In this update report, we also respond to the geotechnical aspects of the City of Santa Barbara's Pre-Application Review Team Comments (Section 2) pertaining to 1925 El Camino De La Luz, dated August 9, 2013, and provide a summary of our review of the project plans (See attached Plan Review letter dated September 10, 2015).

1. UPDATE OF SITE CONDITIONS

Since our Geologic and Geotechnical Investigation report, dated October 8, 2012, is approximately 3 years old, we performed a site inspection in 2014 to document the existing site conditions, performed additional topographic surveying, and performed instrumentation readings of inclinometers and piezometers that we installed previously at the site. Our site reconnaissance mapping reveals that the site surface conditions have not changed significantly since October of 2012, and there are no surface indications of landslide movement. The inclinometers and piezometers installed within the small-diameter boreholes during our subsurface exploration in 2011 were monitored and revealed that there is no subsurface evidence of landslide movement. Subsurface groundwater levels show a gradual decrease over time, consistent with expected groundwater behavior during the current 4-year drought. We have included updated inclinometer and piezometer data as Appendix 1 to this update report.

2. RESPONSE TO CITY PRE-APPLICATION REVIEW TEAM COMMENTS

Cotton, Shires and Associates, Inc. is providing the following responses and associated attachments in order to address review comments provided by the City of Santa Barbara in their Pre-Application Review Team Comments pertaining to 1925 El Camino De La Luz, dated August 9, 2013. The City comments are provided in italics followed by CSA's response to each comment.

II. Comments and Issues

A. Planning Division

1. ***Comment 1: Top of Bluff/Bluff Edge Determination*** *– Both City and Coastal Commission Staff disagree with the determination of top of bluff/bluff edge described in the Coastal Bluff Position Aerial Photograph Analysis, 1950-2000 report by Joseph Scepan, Geoscience Consultant (September 18, 2012). Based on the bluff edge definition included in the California Code of Regulations (CCR Title 14, 13577), both City and Coastal Commission Staff believe that the bluff edge is located further inland (at approximately the 127-foot contour) rather than as shown on the site plan. In order to fully understand how the proposed determination of bluff edge was made, please describe, specifically, how it meets the California Code of Regulations definition of bluff edge.*

CSA Response – Top of Bluff/Bluff Edge Determination – CSA performed a detailed topographic survey of the site, with the attached Profile A-A' representative of the site conditions. Recent (2014) site reconnaissance indicates that the site topography has not experienced significant changes between the time of our survey and the present. The precipitous cliff located from elevations 10 to 50 feet (MLLW) on the profile is, by the definition as outlined in CCR Title 14, 13577, a coastal bluff. The text of CCR Title 14, 13577 is shown below:

(h) Coastal Bluffs. Measure 300 feet both landward and seaward from the bluff line or edge coastal bluff shall mean:

(1) those bluffs, the toe of which is now or was historically (generally within the last 200 years) subject to marine erosion; and

(2) those bluffs the toe of which is not now or was not historically subject to marine erosion, but the toe of which lies within an area otherwise identified in Public Resources Code Section 30603(a)(1) or (a)(2).

Bluff line or edge shall be defined as the upper termination of a bluff, cliff, or Seacliff. In cases where the top edge of the cliff is rounded away from the face of the cliff as a result of erosional processes related to the presence of the steep cliff face, the bluff line or edge shall be defined as that point nearest the cliff beyond which the downward gradient of the surface increases more or less continuously until it reaches the general gradient of the cliff. In a case where there is a step-like feature at the top of the cliff face, the landward edge of the topmost riser shall be taken to be the cliff edge. The termini of the bluff line, or edge along the seaward face of the bluff, shall be defined as a point reached by bisecting the angle formed by a line coinciding with the general trend of the bluff line along the seaward face of the bluff, and a line coinciding with the general trend of the bluff line along the inland facing portion of the bluff. Five hundred feet shall be the minimum length of bluff line or edge to be used in making these determinations.

CSA's reasons for determining that the top of the coastal bluff at 1925 El Camino De La Luz is near elevation 50 feet (MLLW) rather than the City's determination of elevation 127 feet (no datum given), is as follows:

1. **The precipitous cliff located from elevation 10 to 50 feet (MLLW) on Profile A-A' is a classic representation of a coastal bluff and fits the definition as outlined in CCR Title 14, 13577. This geomorphic feature qualifies as a "line or edge defined as the upper termination of a bluff, cliff, or seacliff". As described by Coastal Commission staff ("Establishing Development Setbacks from Coastal Bluffs", 2002), "The bluff edge is simply the line of intersection between the steeply sloping bluff face and the flat or more gently sloping bluff top" which is precisely what is delineated in Profile A-A'. This profile was generated using site specific, detailed topographic surveying whereas the pronounced break in slope at elevation 50 feet (MLLW) was identified in the field with sufficient ground survey points obtained to delineate the slope break.**

2. **The profile clearly shows that there is no rounded edge due to erosion, and thus, no continuous gradient change toward the bluff which would necessitate**

the interpretation of "continuous gradient changes" to delineate the top of bluff.

3. **There is no "step-like feature at the top of the cliff face" that would warrant the use of the landward edge of an upper riser to delineate the top of bluff. The profile shows a more or less continuous 16-degree hillside gradient upslope from the top of the 50-degree bluff face at elevation 50 feet (MLLW), where this 16-degree hillside gradient extends for approximately 220 feet (horizontally) before inflecting to a hillside gradient sloping up at a 4-degree angle. The moderate sloping 16-degree hillside has a minor topographic inflection at elevation 80 feet (MLLW), but this is a result of artificial fill placement by the City in 1978. In order for the top of bluff to be at elevation 127 feet, one must classify some portion of the 16-degree moderately sloping hillside as 'cliff face', with a step-like feature at its top, which is clearly not the case.**

4. **In CSA's opinion, if disagreements are found with locating the top of a coastal bluff, the most reasonable location for logical determination of the top of a coastal bluff is where geologists would be tasked with measuring bluff-top retreat. In the case of 1925 El Camino De La Luz, there is only one feature on the aerial photographs that responds to coastal processes that can be tracked through time and measured, and that is the prominent break in slope near elevation 50 feet (MLLW). Setting residential structures back from the point of active retreat is a meaningful and prudent planning strategy. In this case, there would be no point in setting back from elevation 127 feet since this spot on the profile has essentially no historical retreat, all of which is taking place at the cliff face between elevations 10 and 50 feet (MLLW).**

5. **It is our opinion that the 1978 landslide should have no bearing on the delineation of the top of coastal bluff, since there are no provisions to account for safety factors in the CCR Title 14, 13577. The geomorphic position of the bluff should control, as per CCR, and the Project Geologist and Geotechnical Engineer should ensure that the building site will not be adversely impacted by landsliding upslope from the coastal bluff, which has been demonstrated in this case. Another example where this has taken place is the Palos Verdes peninsula where elevated marine terraces create "step-like features" that extend to the top of the peninsula, thousands of feet inland. These marine**

terraces have been elevated to their current position through tectonic uplift forces, similar to the marine terrace of the Santa Barbara Mesa. The landward edge of the top-most riser is not used for determining the top of the bluff in these areas, or other areas containing multiple uplifted terraces. Therefore, a horizontal limit to what is termed a "step-like feature" needs to be established. In the case of 1925 El Camino De La Luz, more than 220 feet separates the precipitous coastal bluff from what the City appears to regard as an upper riser. If this 16-degree moderately sloping feature extended back to Highway 225, it is unlikely that the top of bluff would be considered to be at Highway 225.

6. **Landslides have dissected terraces in many places along the California coast, and the coastal bluff does not automatically shift inland to the headscarp of this landslide. In fact, residential building has been allowed on stable portions of landslides, far seaward of the headscarp [examples: Abalone Cove and Portuguese Bend (Rancho Palos Verdes) and Big Rock Mesa (Malibu) landslides). The top of the headscarp has never been considered to be the top of the coastal bluff in these areas. The proposed residential development at 1925 ECDLL will not be founded on a landslide, but founded in stable bedrock materials principally upslope from the landslide, with the prominent break in slope of the coastal bluff over 100 feet seaward from the seaward edge of the construction envelope.**

III. Applications Required

D. Building and Safety Division

1. Building Permit Plan Requirements – The following requirements shall be incorporated into the construction plans submitted to the Building and Safety Division with applications for building permits. All of these construction requirements shall be carried out in the field and completed prior to the issuance of a Certificate of Occupancy:

d) The engineering geologist and the geotechnical engineer will be required to submit a letter that they have reviewed your project and that it is in compliance with their recommendations.

CSA Response: CSA has reviewed the latest set of plans, dated September 2015 and is providing a summary of our plan review in separate plan review letter, dated

September 10, 2015.

IV. Required Additional Information for Application Submittal
D. Building and Safety Division

1. <u>Review Comment 1</u>*: Preliminary Geologic and Geotechnical Investigation – Oct. 2012: Provide structural calculations that justify and confirm the use of the building loads specified on page 37 of this report; "We modeled the residential loads assuming two parallel contiguous point loads of 850 lbs, 20 feet apart."*

<u>CSA Response to Comment #1</u> – The preliminary point load values used to represent the proposed structures were reviewed by the Project Structural Engineer. Upon review and additional analysis, the Project Structural engineer updated the proposed building loads and recommended a point load of 3,018 pounds on the lower shear pin and a point load of 18,600 pounds on the upper shear pin (calculations included in Attachment A). Consequently, the slope stability analyses were updated to include these recommended point loads. In our October, 2012 Geologic and Geotechnical Report, a summary of the slope stability analysis results is presented in Table 3 on Page 38; Slope Stability Analysis (SSA) Run #'s 5 through #10 from this table have been re-calculated using the revised point loads. We have summarized the results of this analysis in the following table.

Table 1 – Summary of Revised Slope Stability Analyses

SSA Run #	Condition	Lower Point Load (k)	Upper Point Load (k)	Factor of Safety
5	Critical Deep Surface, post construction of SP walls/ TBs / house loads, slide debris removed	3.0	18.6	1.68
6	Same Critical Surface and construction as Run 5, Seismic with k=0.15	3.0	18.6	1.24
7	Potential Failure through upper shear pin wall (post construction, slide debris)	3.0	18.6	1.94
8	Same as Run 7, now with seismic k=0.15	3.0	18.6	1.17

9	Same as Run 5, with landslide debris in place downslope of lower SP	3.0	18.6	2.41
10	Same as Run 5, with landslide debris in place downslope of lower SP, now with seismic k=0.15	3.0	18.6	1.66

2. *Review Comment 2*: *Preliminary Geologic and Geotechnical Investigation – Oct. 2012: Provide justification for the use of a base safety factor of 1.01 for the area of the landslide debris listed on page 38 of this report.*

CSA Response – CSA utilized a factor of safety of 1.01 for the landslide debris for the purpose of back-calculating the strength of the basal rupture for forward analyses. Our slope monitoring reveals that the landslide debris is not moving, and thus, must contain a minimum factor of safety of 1.01 (and probably greater). CSA's monitoring includes periodic measurements of 2 slope inclinometers within the landslide debris, and periodic visual inspections of the landslide, neither of which show any evidence of recent movement. It is also noteworthy that Profile A-A' does not reflect grading and keyway stabilization of the western portion of the landslide, which likely has three-dimensional stabilization impacts that are not realized along the two-dimensional cross section line. In other words, the stabilization work performed in the mid-1980s along the western portion of the landslide included the excavation of a keyway below the landslide basal shear surface, and replacement with engineered fill that necessarily adds a stabilizing component to this portion of the landslide, which also likely adds a stabilization component to the entire landslide as a whole (three-dimensional effects). Consequently, while we have used FS=1.01 for the landslide debris, which is the minimum safety factor for a marginally stable slope, the actual factor of safety is likely greater than 1.01. Determining this FS with more specificity would entail a subsurface exploration program of all of the nearby properties containing the landslide debris to adequately characterize the actual safety factor, which was beyond the scope of our investigation.

Additional slope stability analyses were conducted on Slope Stability Section A-A' to estimate the approximate location of a potential failure surface with a Factor of Safety of 1.5. Two scenarios were considered: 1) the existing landslide in–place (current condition), and 2) the theoretical condition where the landslide is evacuated (conservatively not relied upon for any buttressing effect). The computer program,

material properties, method of analysis were the same as used previously and summarized in the October 2012 report. For the current analyses, the minimum slide surface depth was restricted to 10 feet to ignore shallow surficial potential failure surfaces and a block search method was use. The results indicate that for the landslide in-place (current conditions), the minimum Factor of Safety for the conditions analyzed was FS = 2.16.

V – Environmental Review: The project would occur on a parcel that was one of several significantly impacted by a landslide event in 1978. Grading and construction work associated with the project would also occur on areas adjacent to a coastal bluff. There is, therefore, a reasonable possibility that the project could result in a significant effect to the environment with respect to geologic issues.

<u>CSA Response</u> **– Had the residential structure at 1925 El Camino De La Luz been constructed to the standards of today, including deep foundations secured into competent bedrock, this structure would not have been adversely impacted by the 1978 landslide. Furthermore, had appropriate drainage measures been implemented all along this area flanking the landslide, it is likely that the landslide would not have occurred. A large buttress fill, keyed and benched into competent bedrock has been constructed along the western headscarp region of the old landslide, which also includes surface drainage mitigation. The proposed residential re-construction at 1925 ECDLL would incorporate deep foundations, subsurface drainage mitigation, and surface drainage control and runoff storage. Therefore, it is our opinion that the proposed construction would only have <u>beneficial</u> impacts on slope stability, and thus, would have positive impacts from an environmental standpoint. All grading would be conducted more than 120 feet upslope from the top of the coastal bluff and would occur almost exclusively within the previously City-graded area.**

SUMMARY

This Supplemental Geologic and Geotechnical Investigation and Update Report provides a summary of the updated surface and subsurface site conditions, which have not changed significantly since generation of our Geologic and Geotechnical Report, dated October 8, 2012. We have provided responses to the City Pre-Application Review Team Comments, which further emphasizes that the proposed residential re-use project will have only positive impacts on slope stability and drainage conditions, while providing stabilization benefits for property and City infrastructure upslope. We emphasize that the proposed construction would be located well outside of setback requirements from the identified top of coastal bluff. This supplemental report should be accompanied by our Geologic and Geotechnical Report, dated October 8, 2012, where all geologic and geotechnical design recommendations remain valid.

LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted engineering geology and geotechnical engineering principles and practices. No warranty, expressed or implied, or merchantability of fitness, is made or intended in connection with our work, by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings. We trust that this provides you with the information that you need at this time. If you have any questions or need additional information, please call.

Very truly yours,
COTTON, SHIRES, AND ASSOCIATES, INC.

John M. Wallace
Principal Engineering Geologist, 1923

Patrick O. Shires
Senior Principal Geotechnical Engineer, GE 770

POS:JMW:st

APPENDIX A

Instrumentation Results

Earth Materials

Qt — Quaternary Terrace Deposits

Tm — Monterey Formation

Als — Active Landslide

Map Symbols

SI-5 — Small-diameter boring with inclinometer casing and piezometers installed by Cotton, Shires and Associates, Inc. in May 2011

0.13" 6/1/11-6/10/14 Deflection from 8'-10' bgs — Inclinometer vector indicates magnitude, direction and type of inclinometer movement over the depth interval, below ground surface (bgs), and time interval shown.

LD-3 — Large-diameter boring drilled and logged by Cotton, Shires and Associates, Inc. in October 2011

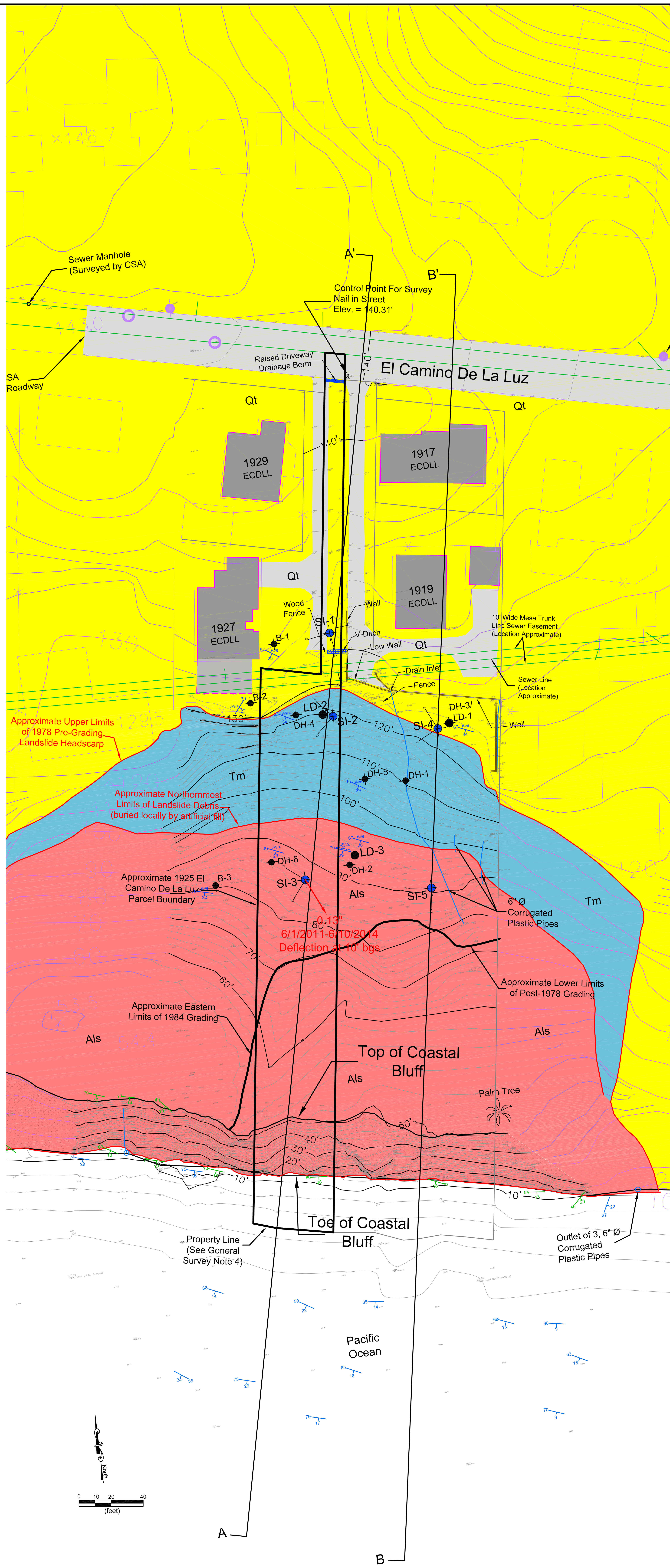
DH-6 — Large-diameter boring drilled by Padre Associates, Inc. in September 2005 (DH-1 and DH-2) and June 2006 (DH-3 through DH-6)

B-3 — Large-diameter boring drilled by Campbell Geo, Inc. in December 2006

Stratigraphic bedding orientations collected by Cotton, Shires and Associates, Inc.

Average stratigraphic bedding orientations collected during the logging of large-diameter borings

Bedding orientation on landslide basal rupture surface collected in large-diameter boring



SURVEY LIMITATIONS NOTES

1. This is not a map of a boundary survey. No property corners have been set as part of this work.

2. Survey monuments found in the course of this mapping are set by others, and have been used only as a reference for the purpose of topographic mapping, without our verification of their agreement with applicable legal descriptions and seniority of deeds.

3. Relation of topographic features (i.e., fences, walls, trees, power poles, etc.) to property lines as shown on this map is subject to the adjustments that a boundary survey may require.

4. This survey was prepared without the benefit of a Title Report. Easements, if shown, should be considered approximate in location.

5. If this map is provided in an electronic format as a courtesy to client, delivery of the electronic CAD file does not constitute delivery of a professional work product. The signed paper print delivered with this electronic CAD file constitutes our professional work product and, in the event the electronic CAD file is altered, the print must be referred to for the original and correct survey information. We shall not be responsible for any modifications made to the electronic CAD file or for any products derived from the electronic CAD file which are not reviewed, signed and sealed by us.

General Survey Notes

1) All dashed lines on this map represent features (houses, walls, topography, etc.) that have not been surveyed by Cotton, Shires and Associates, Inc. (CSA) and are approximate only.

2. Vertical Datum for CSA topography based on NOAA published value for mean lower low water (MLLW) in Santa Barbara.

3. City of Santa Barbara topography and features taken from map dated 4/10/95 (Revised April 1997) from County of Santa Barbara website (http://www.countyofsb.org/pwd/water/TopoFloodControl1.htm).

4. Southern property lines are based on the MHTL elevation of 4.63 feet above MLLW (MHTL from David Skelly, GeoSoils, Inc., "Wave Runup & Coastal Hazard Analysis, 1921 El Camino de la Luz & 1925 Camino de la Luz, Santa Barbara, Santa Barbara County, California").

Map Notes

1) The topographic base map for 1925 El Camino de la Luz was surveyed by Cotton, Shires and Associates on April 15-16, 2010.

2. The criteria used for calculating the average slope are those provided by the City of Santa Barbara Municipal Code Title 22, Section 28.15.080.

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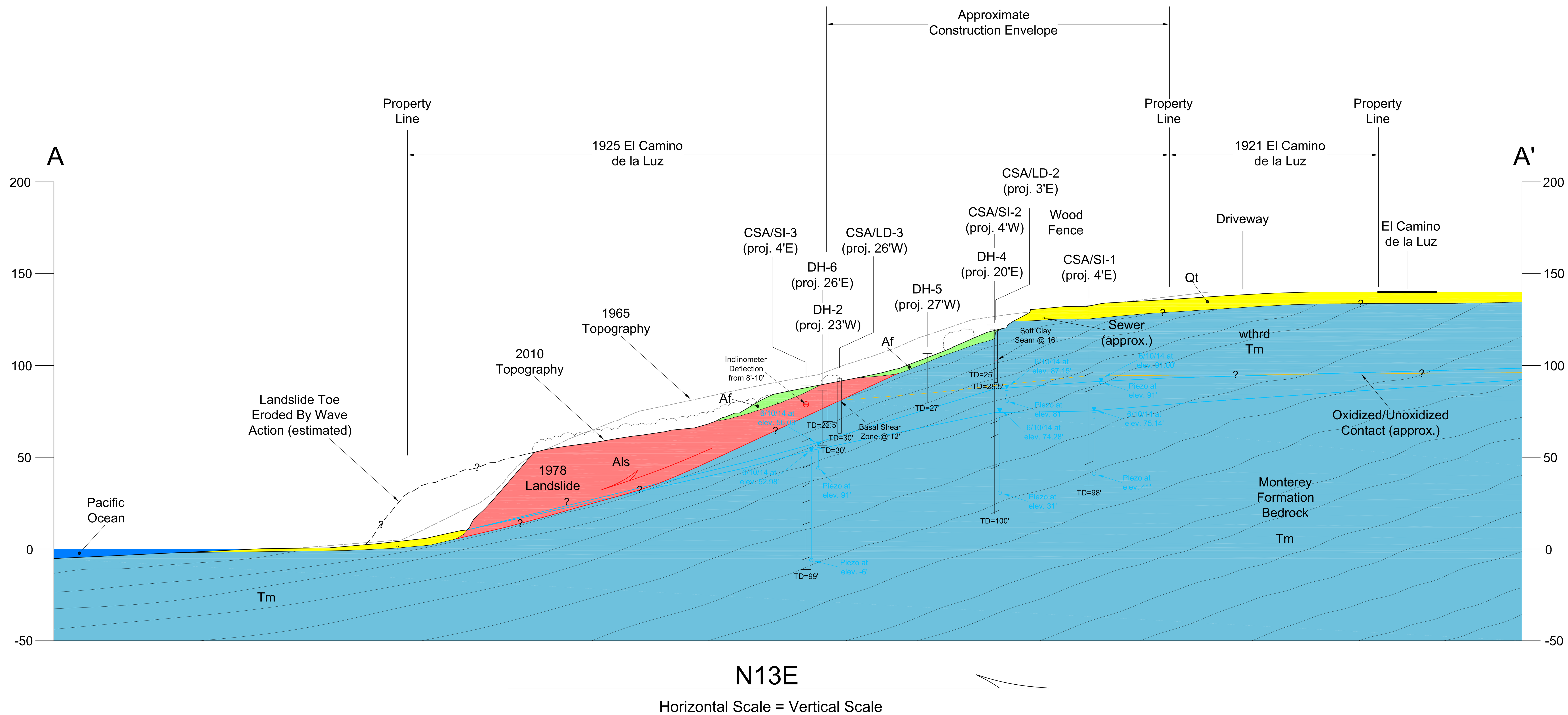
Inclinometer Location Map
1925 El Camino De La Luz
SANTA BARBARA, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
JD	1"= 30'	G0058
APPROVED BY	DATE	PLATE NO.
POS	JUNE 2014	1



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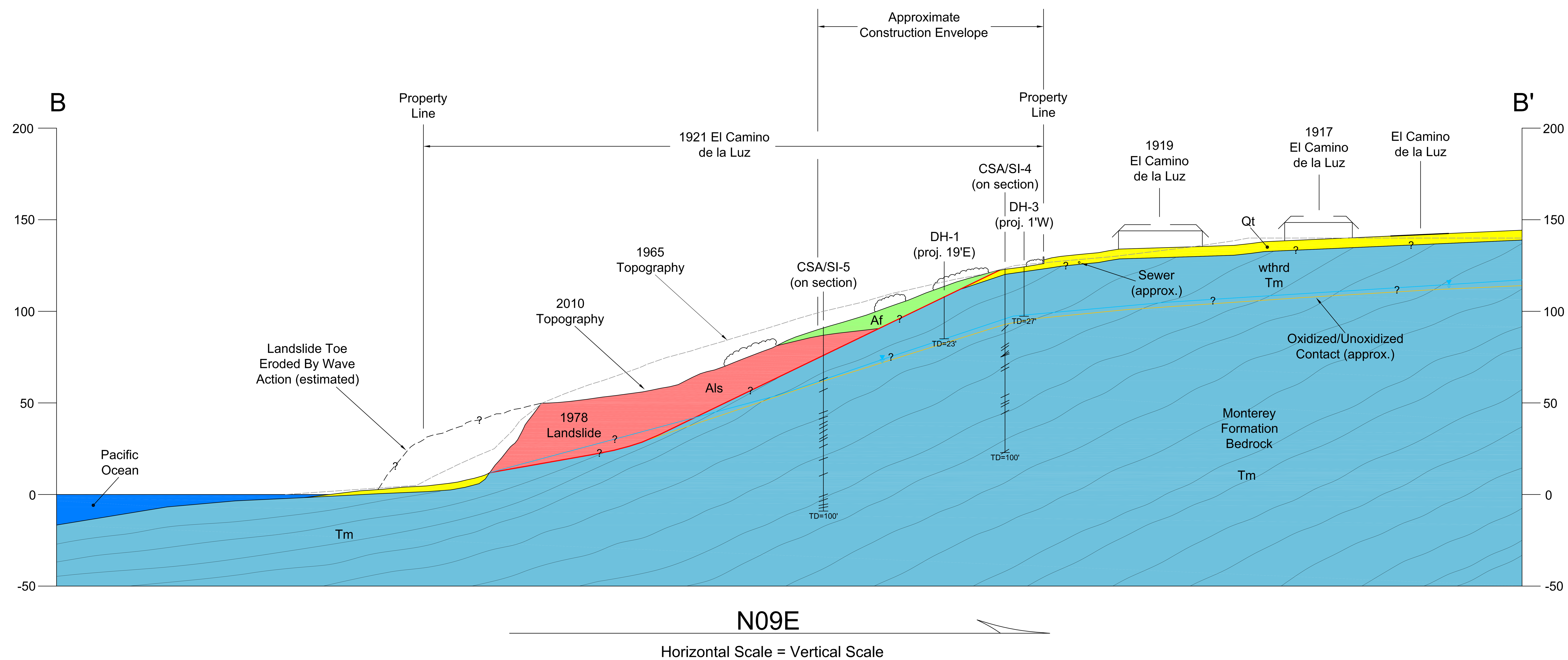
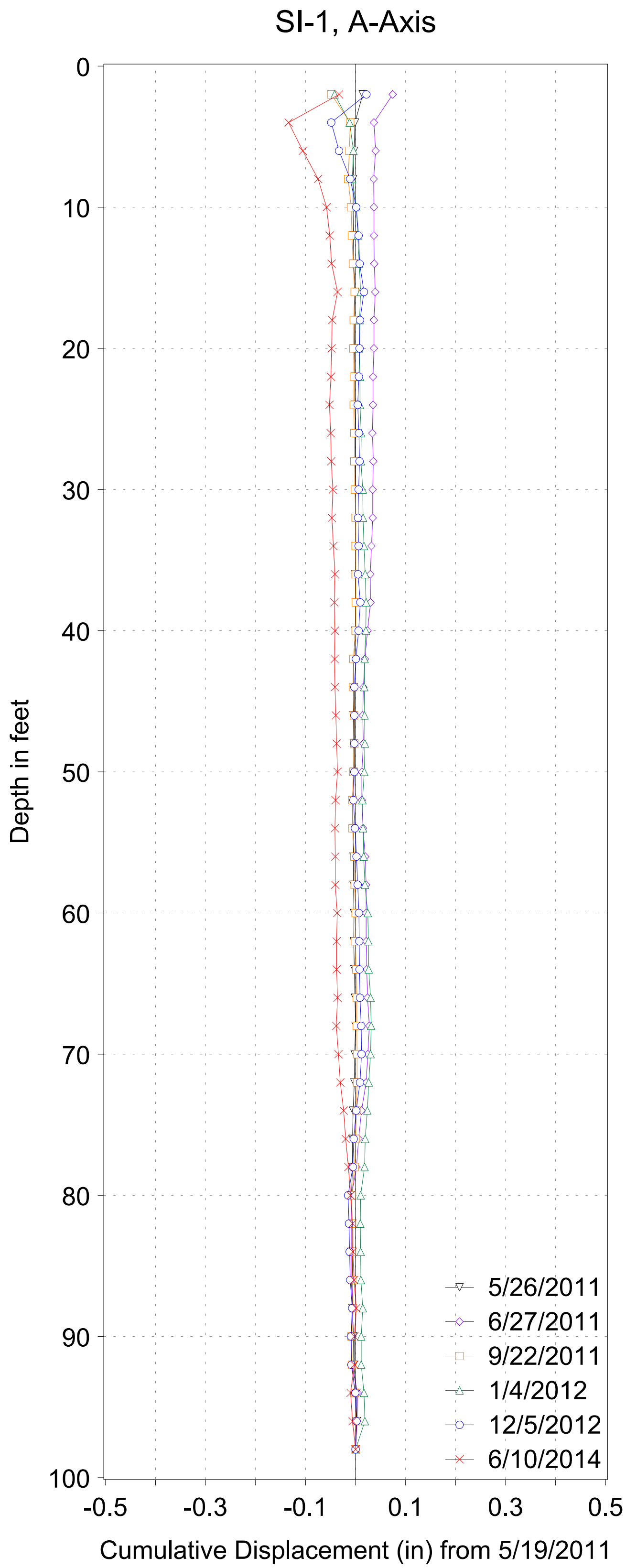
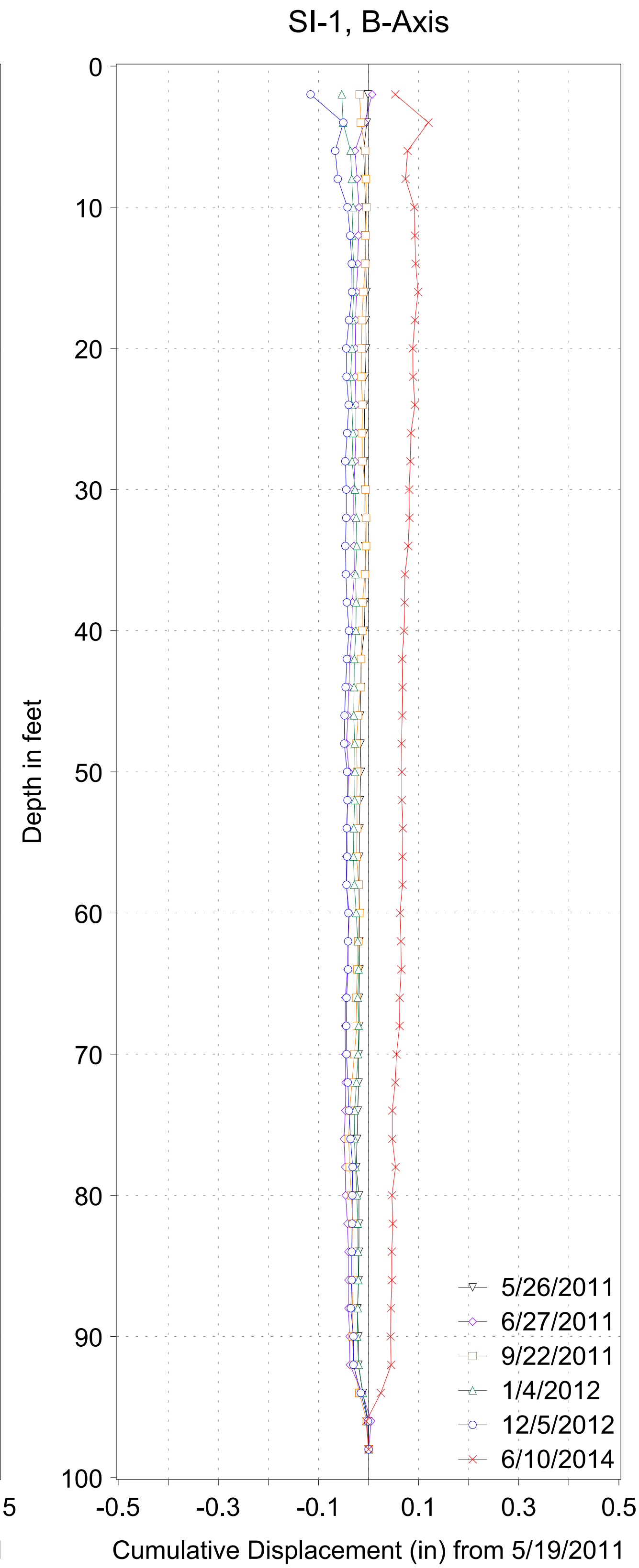
Engineering Geologic Cross Section A-A'
1925 El Camino De La Luz
SANTA BARBARA, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
JD	1"= 30'	G0058
APPROVED BY	DATE	PLATE NO.
POS	JUNE 2014	2



COTTON, SHIRES AND ASSOCIATES, INC. CONSULTING ENGINEERS AND GEOLOGISTS		
Engineering Geologic Cross Section B-B' 1925 El Camino De La Luz SANTA BARBARA, CALIFORNIA		
GEO/ENG BY JD	SCALE 1"= 30'	PROJECT NO. G0058
APPROVED BY POS	DATE JUNE 2014	PLATE NO. 3





Felkay/G0058
A+ Direction: S10E
Top of Casing Elevation=132'

CSA/SI-1

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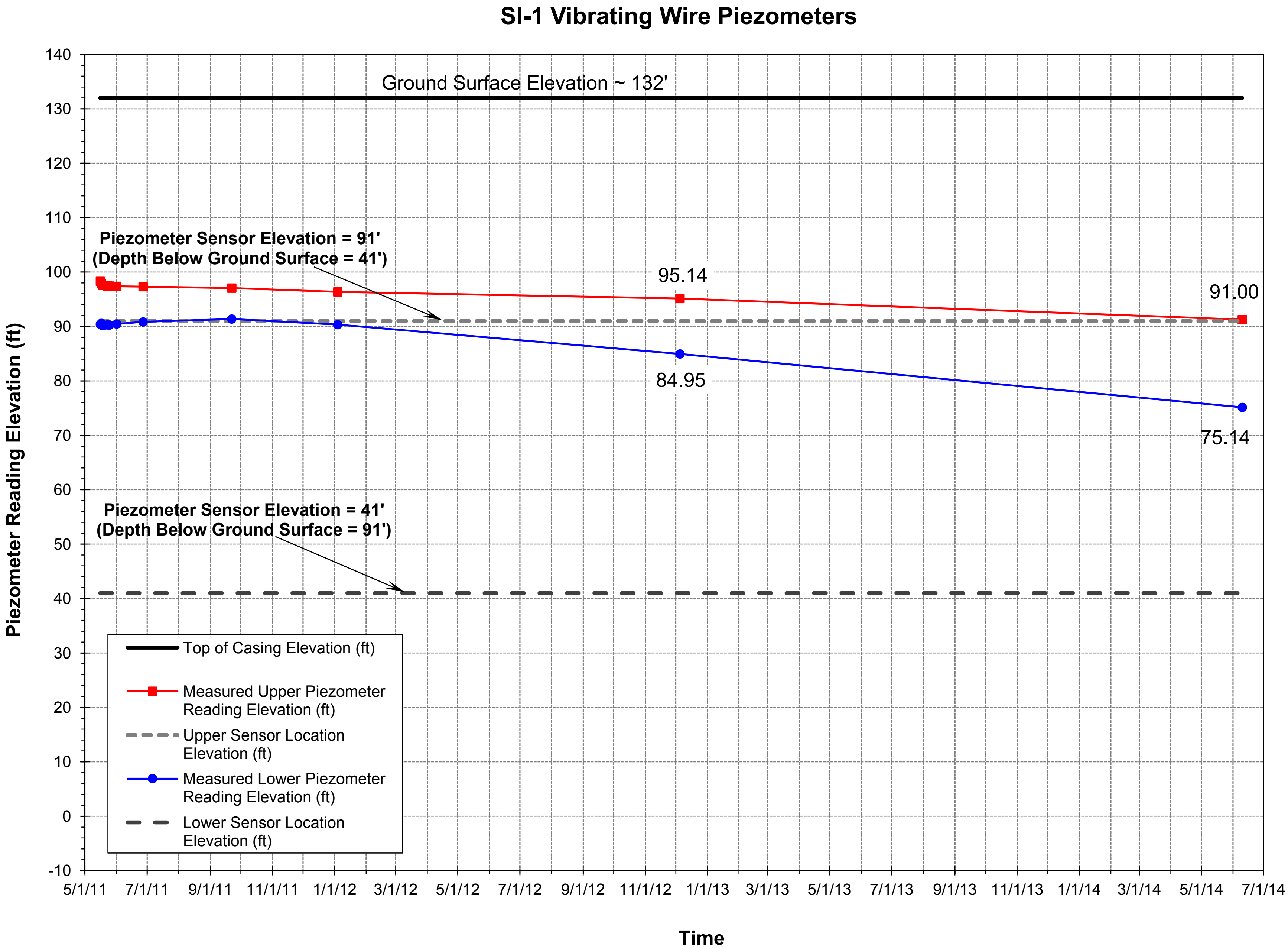
SI-1 Vibrating Wire Piezometers
Ground Surface Elevation ~ 132'
Piezometer Sensor Elevation = 91'
(Depth Below Ground Surface = 41')
95.14
91.00
84.95
75.14
Piezometer Sensor Elevation = 41'
(Depth Below Ground Surface = 91')
Top of Casing Elevation (ft)
Measured Upper Piezometer Reading Elevation (ft)
Upper Sensor Location Elevation (ft)
Measured Lower Piezometer Reading Elevation (ft)
Lower Sensor Location Elevation (ft)
Piezometer Reading Elevation (ft)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
5/1/11
7/1/11
9/1/11
11/1/11
1/1/12
3/1/12
5/1/12
7/1/12
9/1/12
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3/1/13
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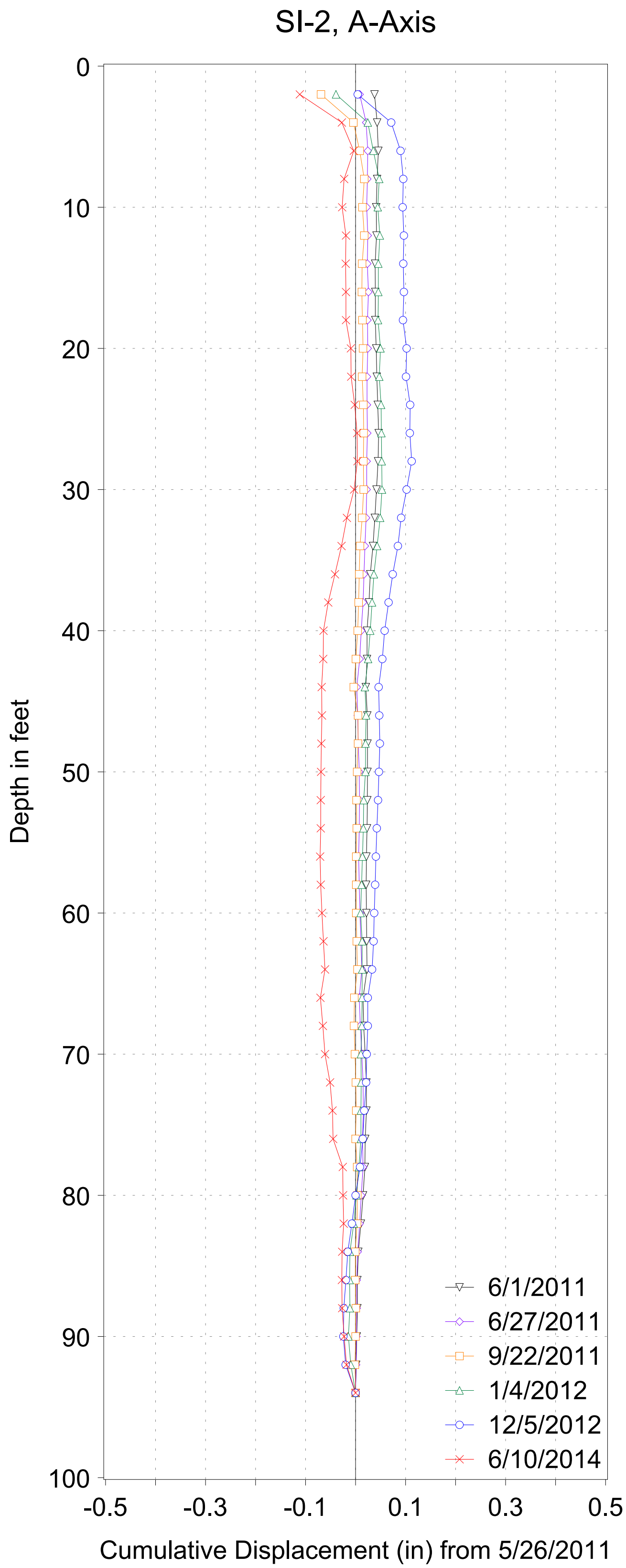
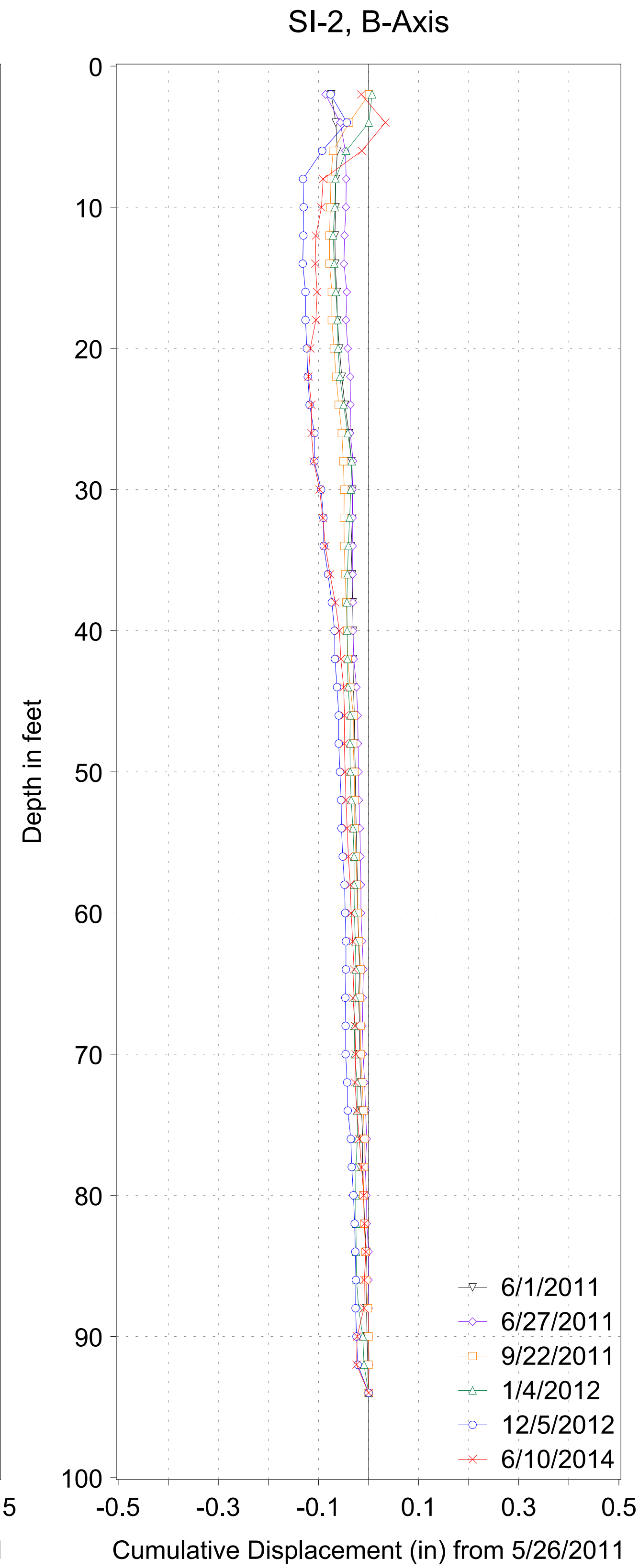
5/1/14
7/1/14
Time





Felkay/G0058
A+ Direction: S48W
Top of Casing Elevation=119'

CSA/SI-2

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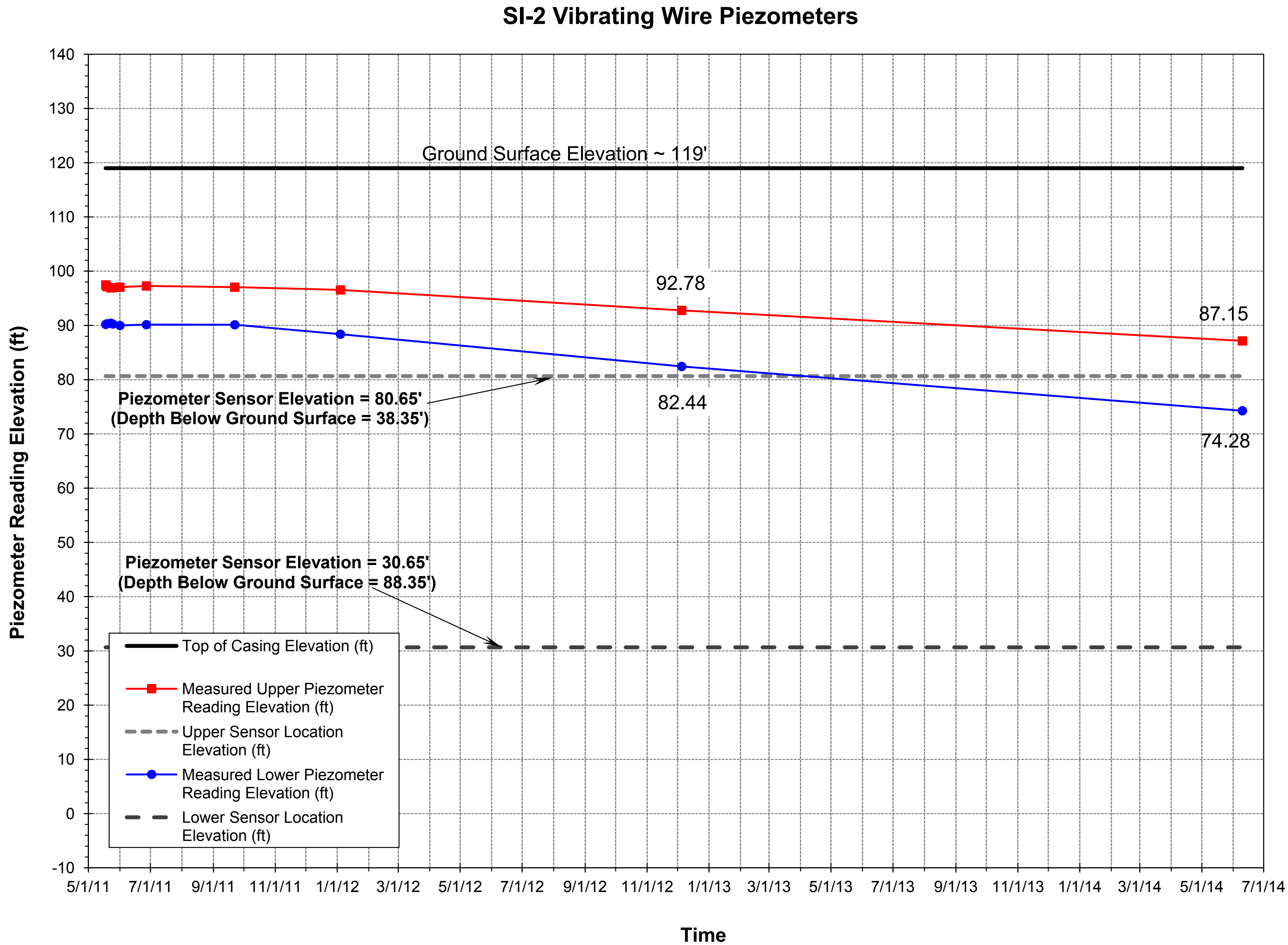
SI-2 Vibrating Wire Piezometers
Piezometer Reading Elevation (ft)
Time
Ground Surface Elevation ~ 119'
92.78
87.15
82.44
74.28
Piezometer Sensor Elevation = 80.65'
(Depth Below Ground Surface = 38.35')
Piezometer Sensor Elevation = 30.65'
(Depth Below Ground Surface = 88.35')
Top of Casing Elevation (ft)
Measured Upper Piezometer Reading Elevation (ft)
Upper Sensor Location Elevation (ft)
Measured Lower Piezometer Reading Elevation (ft)
Lower Sensor Location Elevation (ft)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
5/1/11
7/1/11
9/1/11
11/1/11
1/1/12
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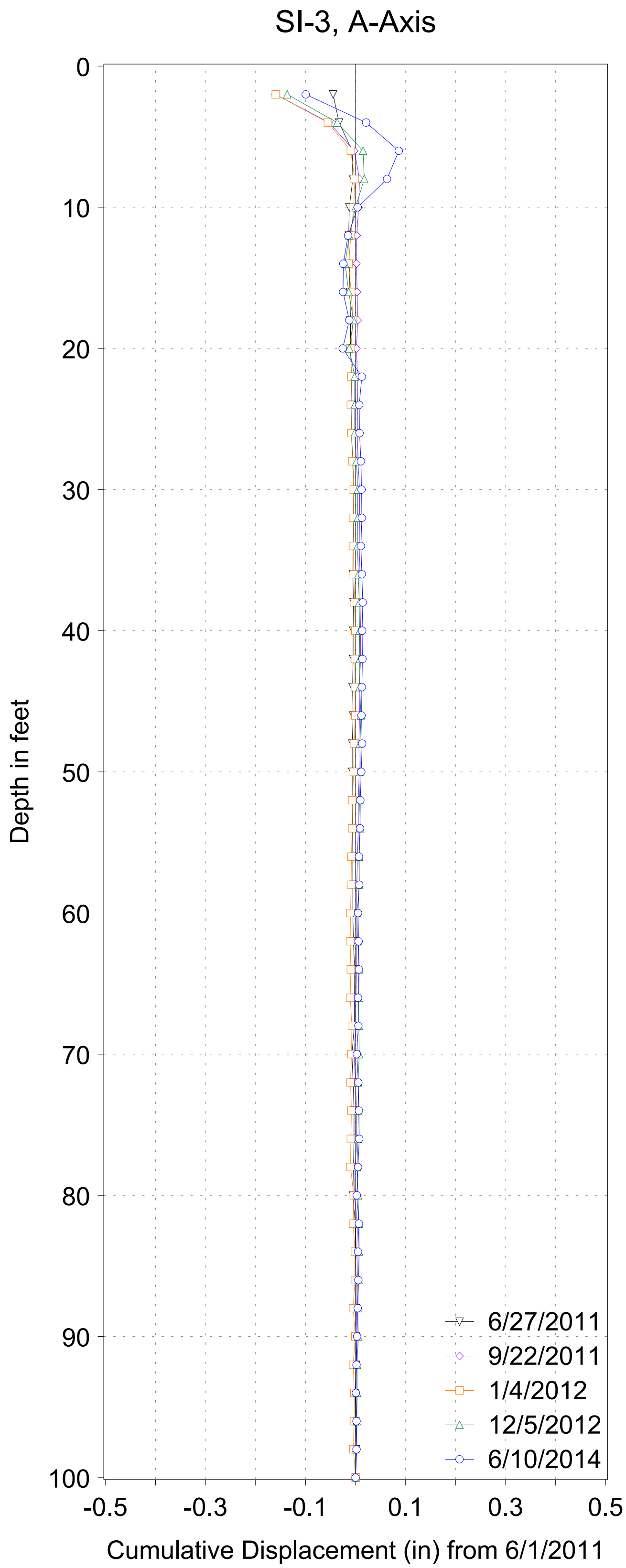
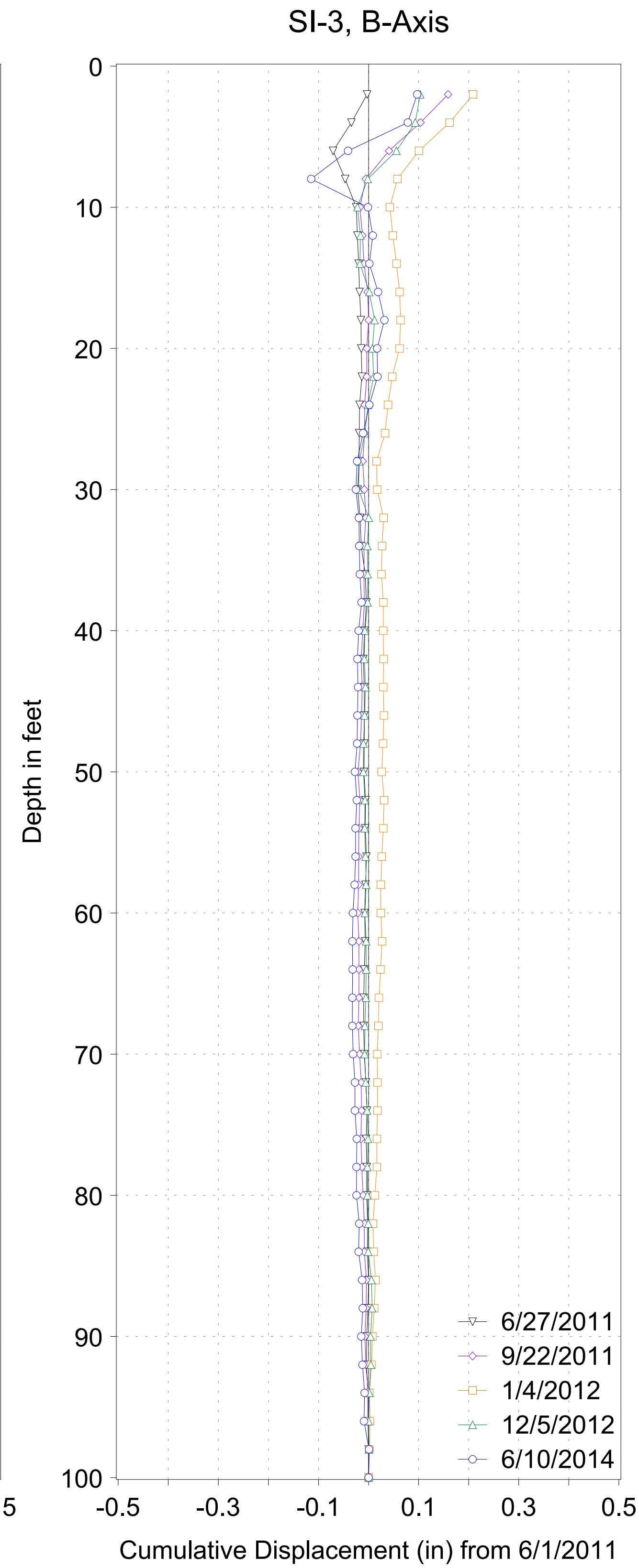
7/1/14





Felkay/G0058
A+ Direction: S38W
Top of Casing Elevation=87'

CSA/SI-3

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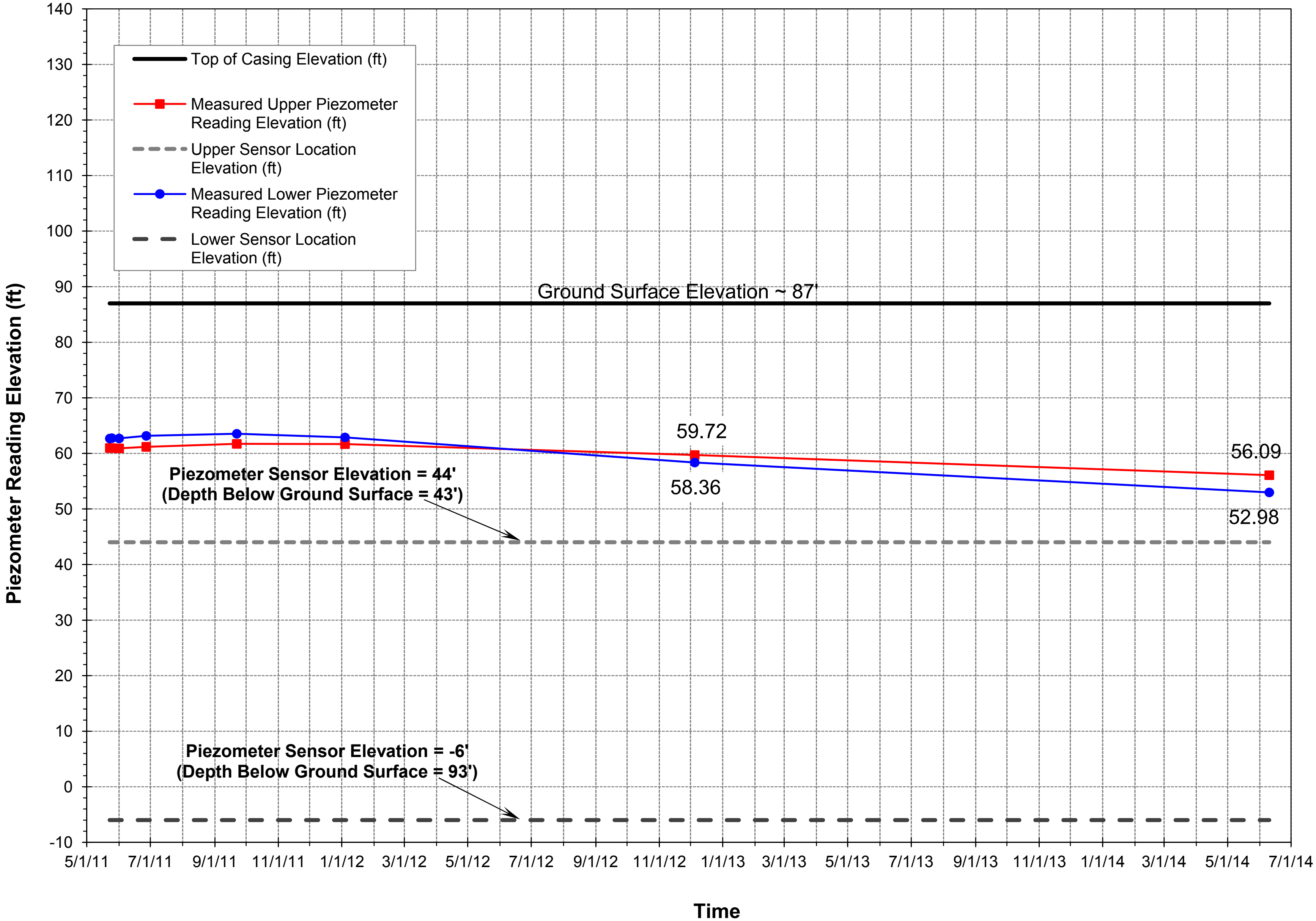
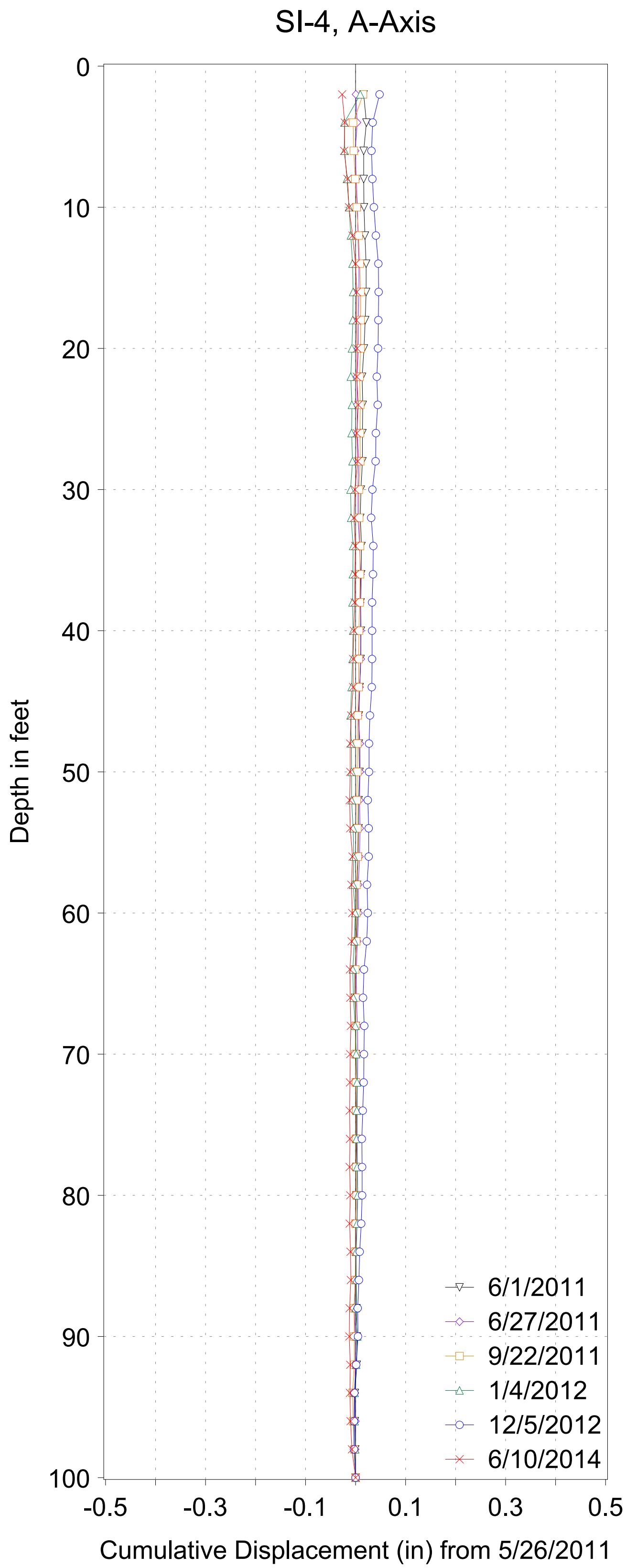
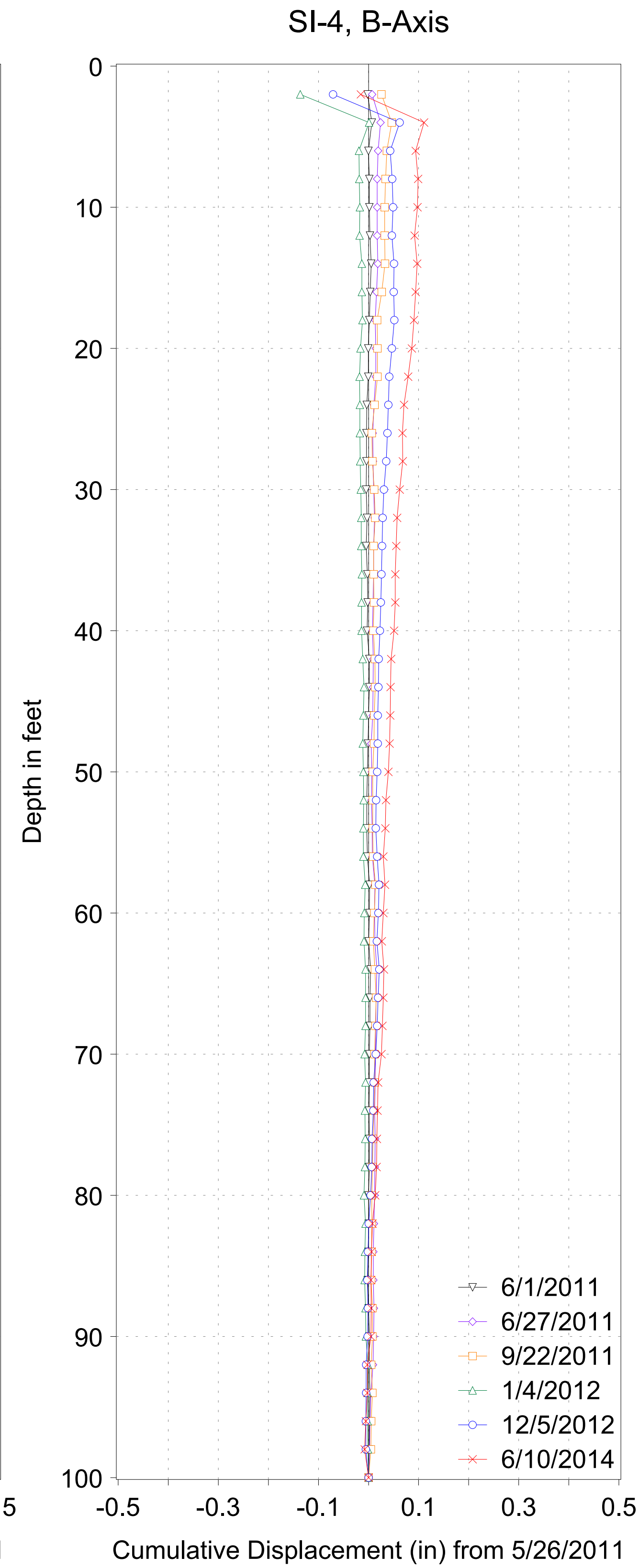
SI-3 Vibrating Wire Piezometers







Felkay/G0058
A+ Direction: S64W
Top of Casing Elevation=123'

CSA/SI-4

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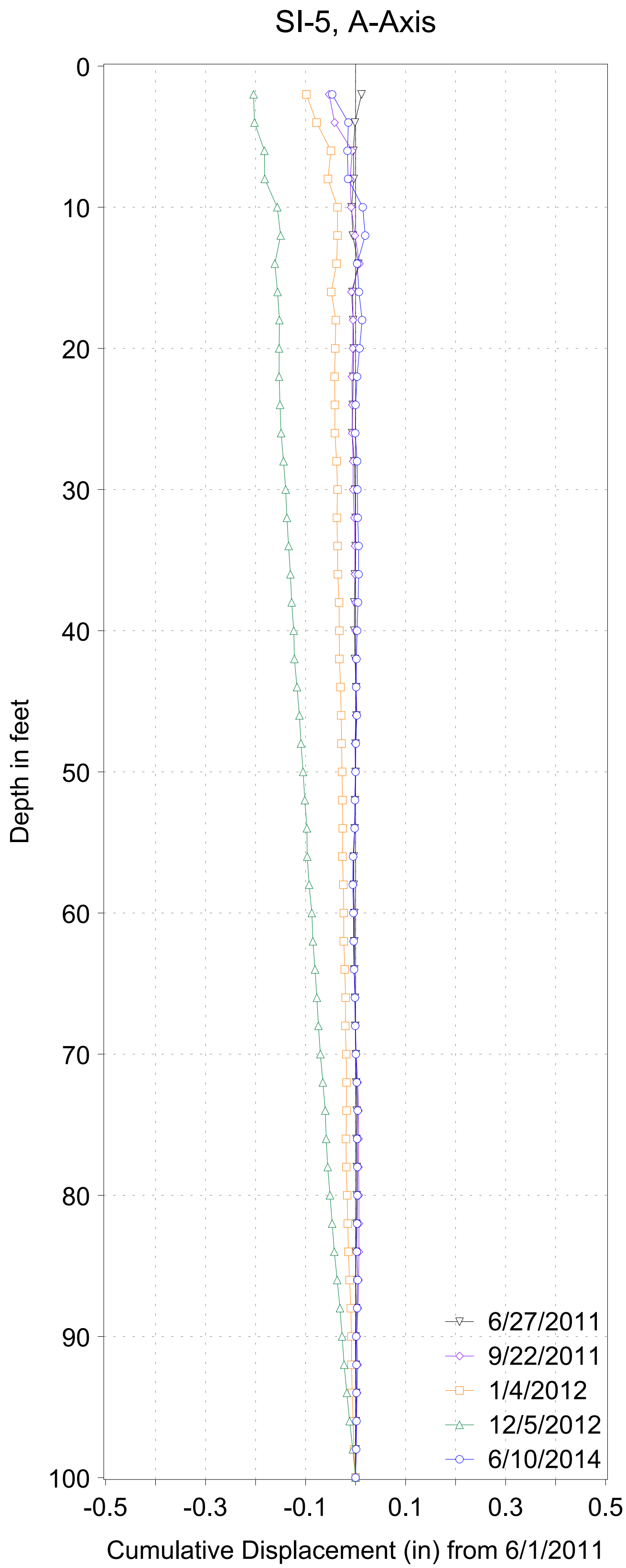
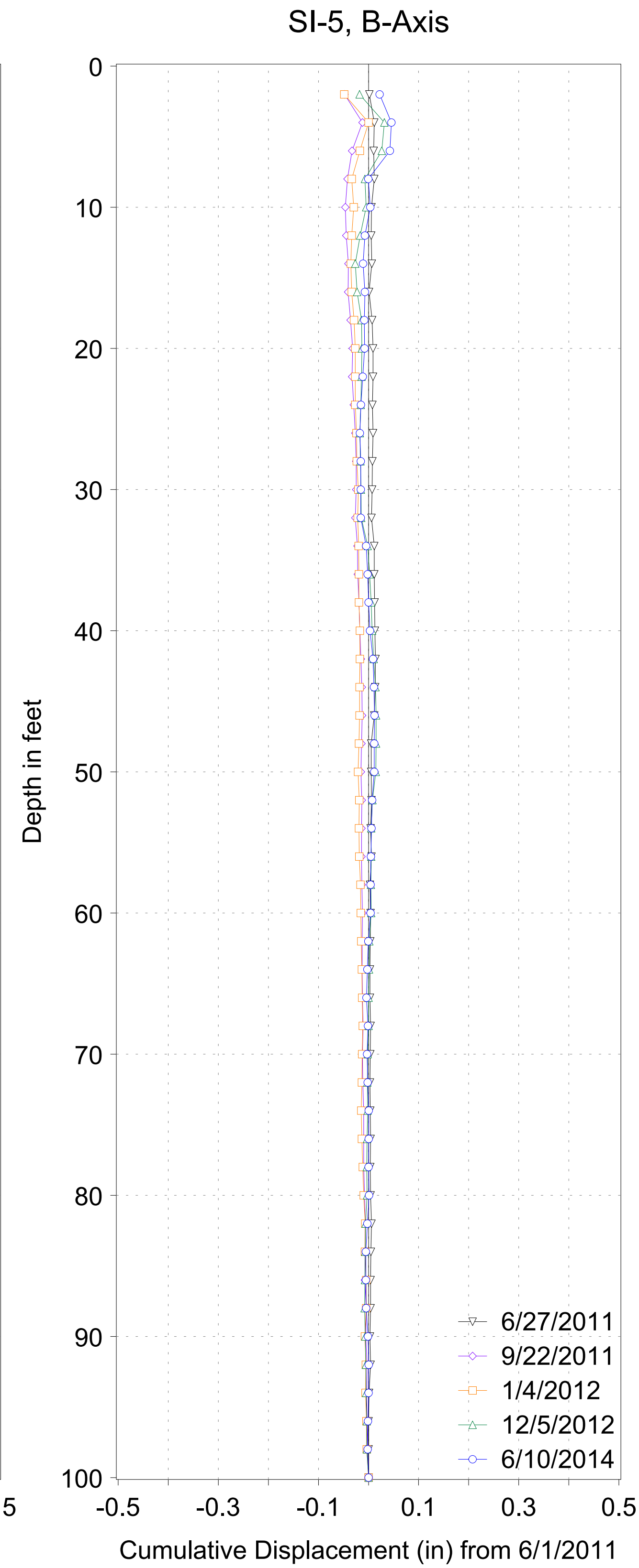




Felkay/G0058
A+ Direction: S06W
Top of Casing Elevation=91'

CSA/SI-5

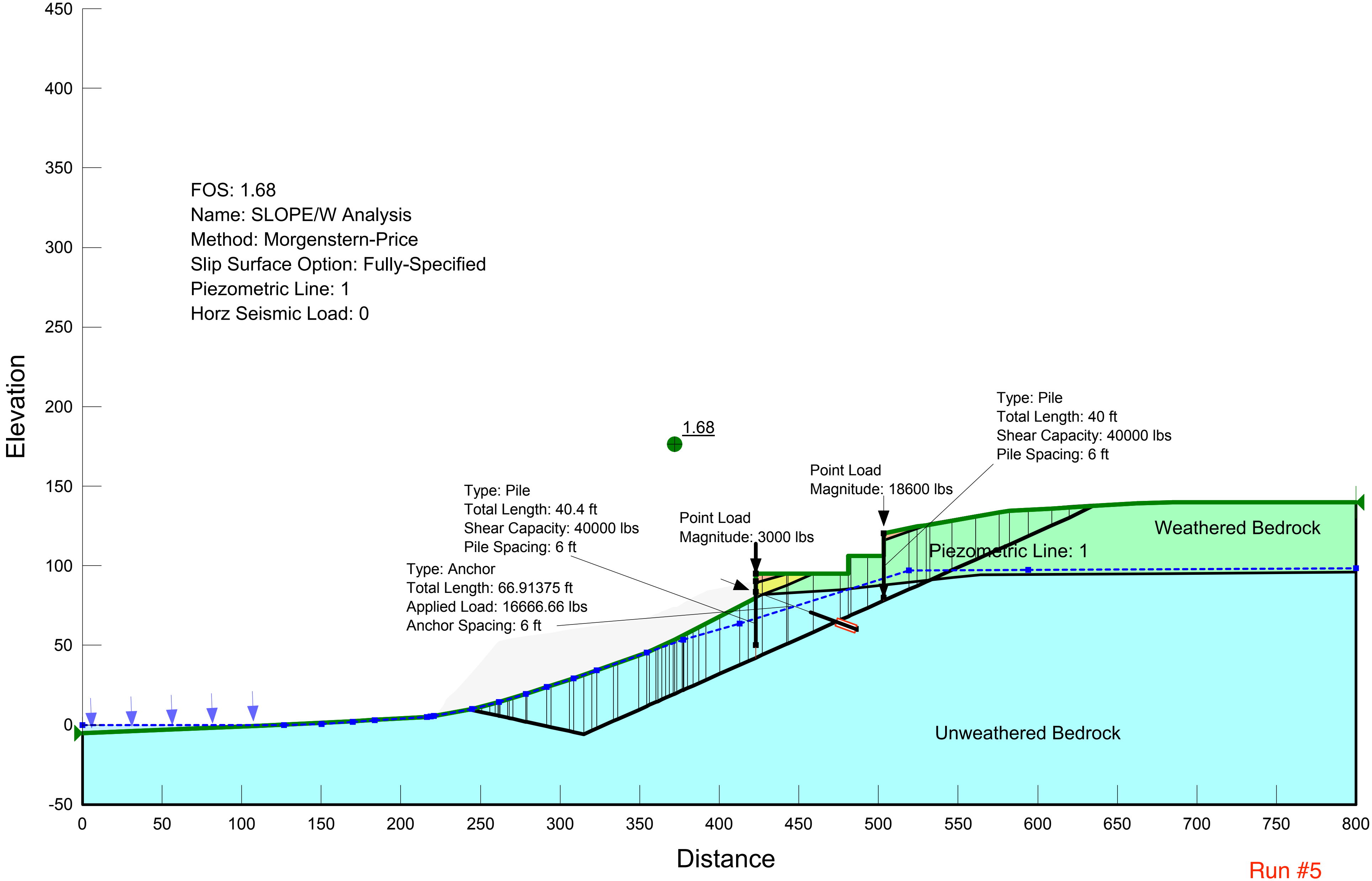
COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

APPENDIX B

Slope Stability Analysis Results

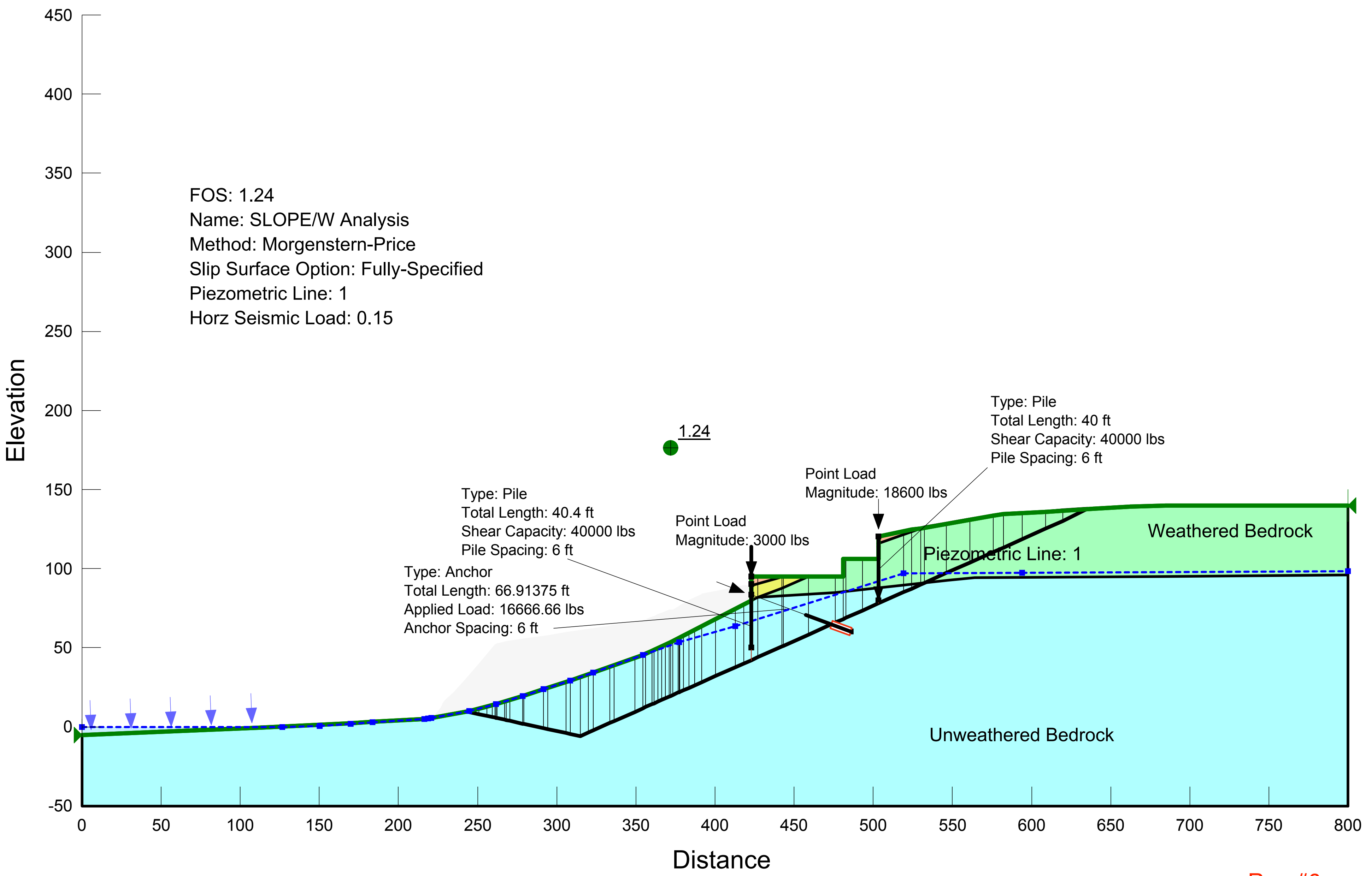
Run #	Condition	Lower SP Wall	Upper SP Wall	TB (k)	October 2012 FS	May 2014 FS
5	Critical Deep Surface, post construction of SP walls/ TBs / house loads, slide debris removed	40	50	100	1.68	1.68
6	Same Critical Surface and construction as Run 5, Seismic with k=0.15	40	50	100	1.23	1.24
7	Potential Failure through upper shear pin wall (post construction, slide debris removed downslope of lower SP)	40	50	100	2.15	1.94
8	Same as Run 7, now with seismic k=0.15	40	50	100	1.24	1.17
9	Same as Run 5, with landslide debris in place downslope of lower SP	40	50	100	2.42	2.41
10	Same as Run 5, with landslide debris in place downslope of lower SP, now with seismic k=0.15	40	50	100	1.66	1.66

Name: Weathered Bedrock Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 ° Phi-Anisotropic Strength Fn.: Phi=45 (weathered)
Name: Unweathered Bedrock Unit Weight: 110 pcf Cohesion: 1 psf Phi: 32 ° C-Anisotropic Strength Fn.: X-bed Cohesion (Unweathered)=2000 Phi-Anisotropic Strength Fn.: Phi=40 (unweathered)
Name: Landslide Debris Unit Weight: 89 pcf Cohesion: 0 psf Phi: 19 °
Name: Af Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 °

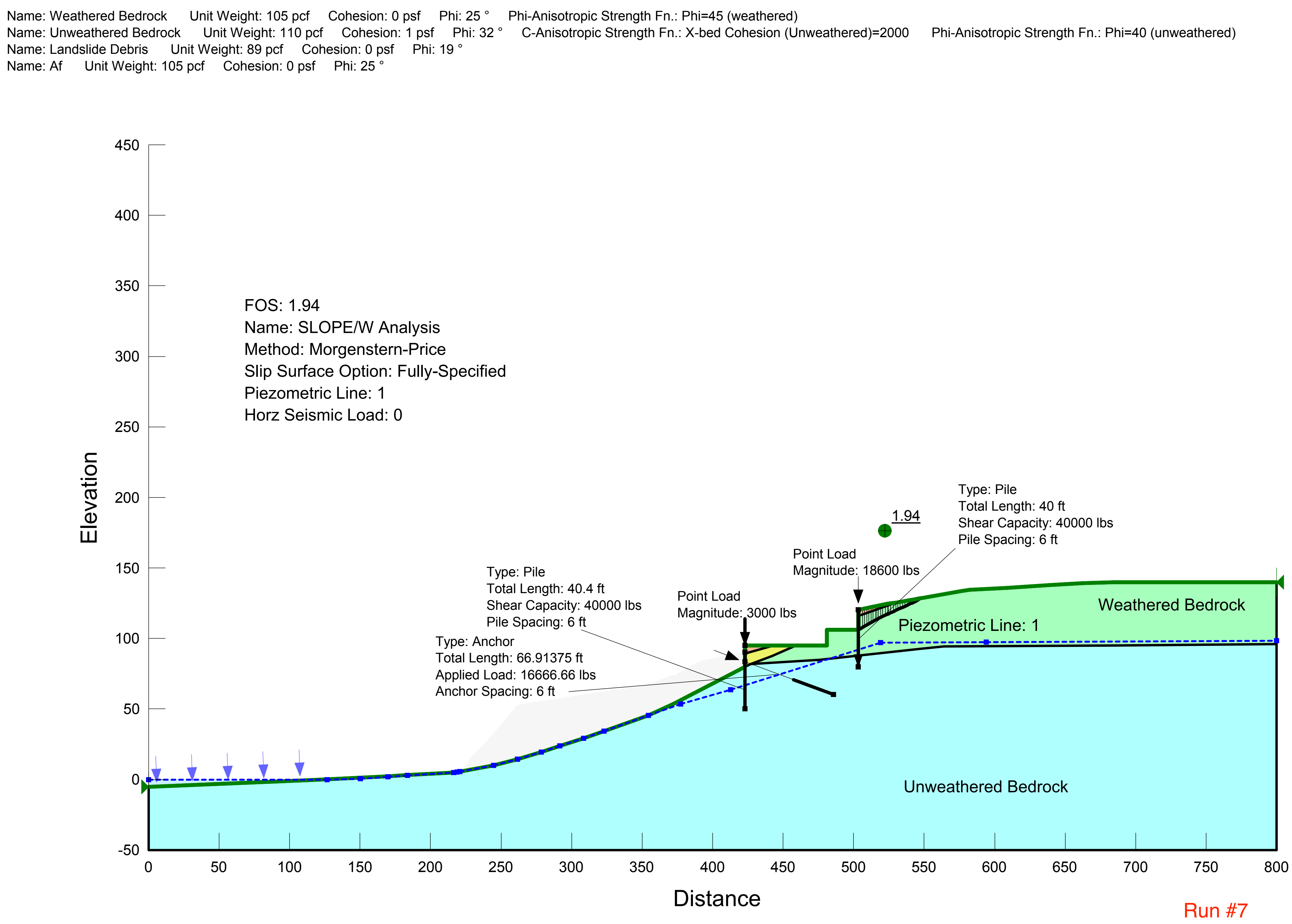


Run #5

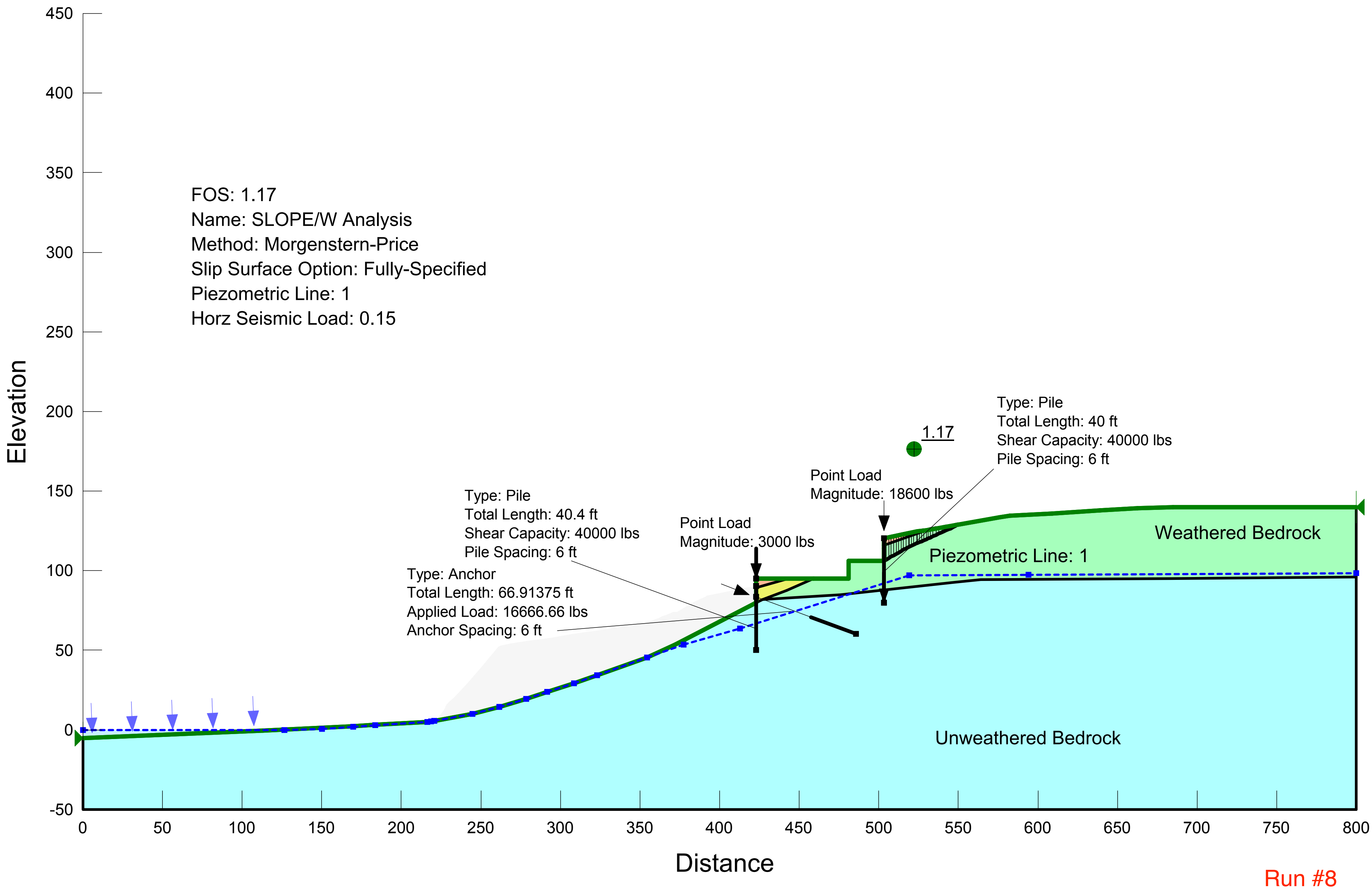
Name: Weathered Bedrock Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 ° Phi-Anisotropic Strength Fn.: Phi=45 (weathered)
Name: Unweathered Bedrock Unit Weight: 110 pcf Cohesion: 1 psf Phi: 32 ° C-Anisotropic Strength Fn.: X-bed Cohesion (Unweathered)=2000 Phi-Anisotropic Strength Fn.: Phi=40 (unweathered)
Name: Landslide Debris Unit Weight: 89 pcf Cohesion: 0 psf Phi: 19 °
Name: Af Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 °



Run #6

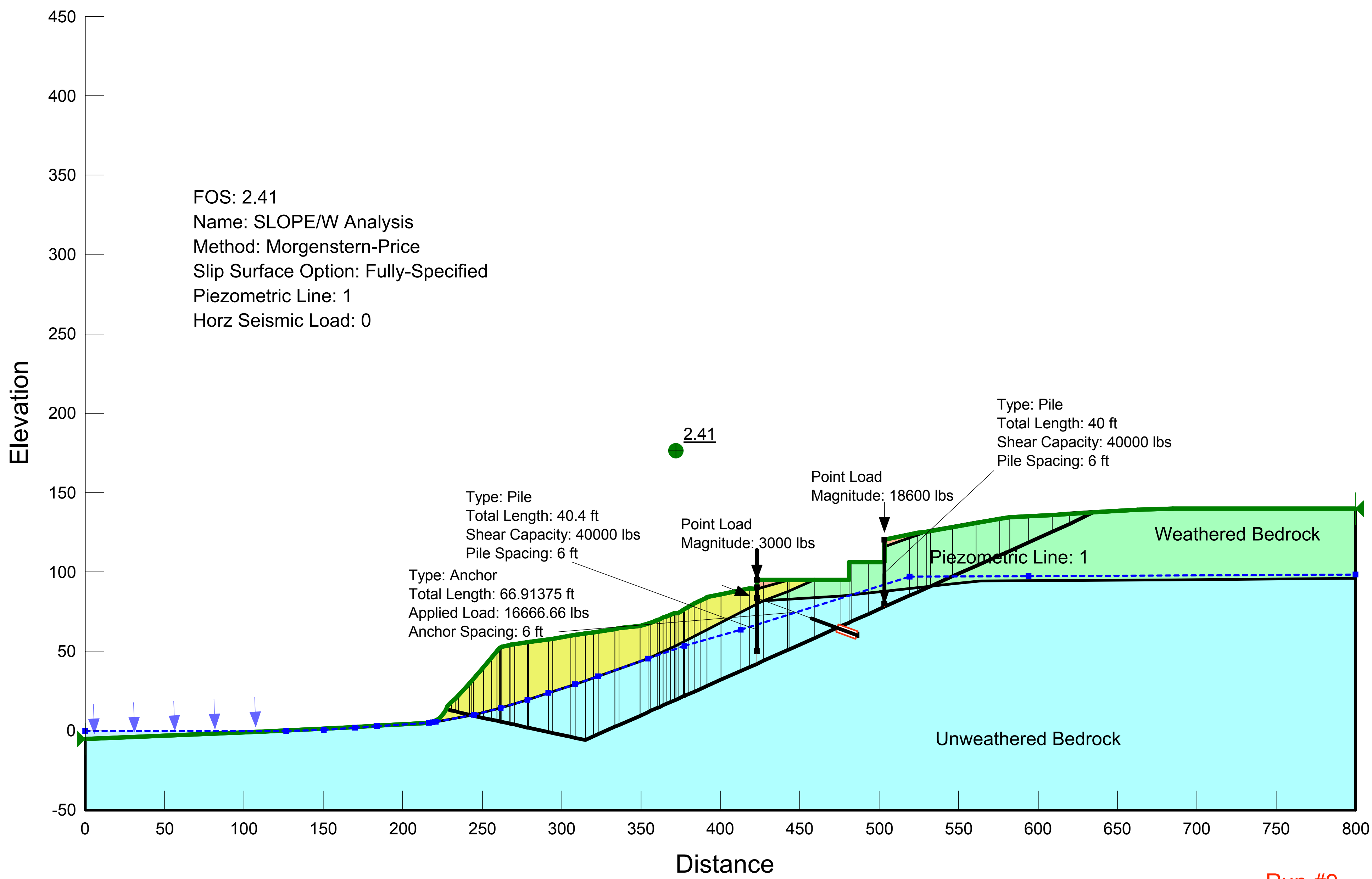

Name: Weathered Bedrock Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 ° Phi-Anisotropic Strength Fn.: Phi=45 (weathered)
Name: Unweathered Bedrock Unit Weight: 110 pcf Cohesion: 1 psf Phi: 32 ° C-Anisotropic Strength Fn.: X-bed Cohesion (Unweathered)=2000 Phi-Anisotropic Strength Fn.: Phi=40 (unweathered)
Name: Landslide Debris Unit Weight: 89 pcf Cohesion: 0 psf Phi: 19 °
Name: Af Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 °
FOS: 1.94
Name: SLOPE/W Analysis
Method: Morgenstern-Price
Slip Surface Option: Fully-Specified
Piezometric Line: 1
Horz Seismic Load: 0
1.94
Type: Pile
Total Length: 40 ft
Shear Capacity: 40000 lbs
Pile Spacing: 6 ft
Point Load
Magnitude: 18600 lbs
Type: Pile
Total Length: 40.4 ft
Shear Capacity: 40000 lbs
Pile Spacing: 6 ft
Point Load
Magnitude: 3000 lbs
Type: Anchor
Total Length: 66.91375 ft
Applied Load: 16666.66 lbs
Anchor Spacing: 6 ft
Weathered Bedrock
Piezometric Line: 1
Unweathered Bedrock
Elevation
Distance
450
400
350
300
250
200
150
100
50
0
-50
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
Run #7

Name: Weathered Bedrock Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 ° Phi-Anisotropic Strength Fn.: Phi=45 (weathered)
Name: Unweathered Bedrock Unit Weight: 110 pcf Cohesion: 1 psf Phi: 32 ° C-Anisotropic Strength Fn.: X-bed Cohesion (Unweathered)=2000 Phi-Anisotropic Strength Fn.: Phi=40 (unweathered)
Name: Landslide Debris Unit Weight: 89 pcf Cohesion: 0 psf Phi: 19 °
Name: Af Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 °



Run #8

Name: Weathered Bedrock Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 ° Phi-Anisotropic Strength Fn.: Phi=45 (weathered)
Name: Unweathered Bedrock Unit Weight: 110 pcf Cohesion: 1 psf Phi: 32 ° C-Anisotropic Strength Fn.: X-bed Cohesion (Unweathered)=2000 Phi-Anisotropic Strength Fn.: Phi=40 (unweathered)
Name: Landslide Debris Unit Weight: 89 pcf Cohesion: 0 psf Phi: 19 °
Name: Af Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 °



Run #9

Name: Weathered Bedrock Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 ° Phi-Anisotropic Strength Fn.: Phi=45 (weathered)
Name: Unweathered Bedrock Unit Weight: 110 pcf Cohesion: 1 psf Phi: 32 ° C-Anisotropic Strength Fn.: X-bed Cohesion (Unweathered)=2000 Phi-Anisotropic Strength Fn.: Phi=40 (unweathered)
Name: Landslide Debris Unit Weight: 89 pcf Cohesion: 0 psf Phi: 19 °
Name: Af Unit Weight: 105 pcf Cohesion: 0 psf Phi: 25 °